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## HAIR TREATMENT COMPOSITIONS COMPRISING HYDROXY COMPOUNDS

FIELD OF THE INVENTION

5 The invention relates to hair treatment compositions. More particularly the invention relates to hair treatment compositions comprising certain hydroxy compounds. The compositions are particularly suitable for repair and  
10 restoration of damaged hair.

BACKGROUND AND PRIOR ART

15 Hair can suffer damage from a number of sources. The hair fibre can be damaged by environmental influences such as exposure to UV and chlorine; chemical influences such as bleaching, perming, overly frequent washing with harsh surfactant-based cleansing shampoo compositions; and mechanical influences such as prolonged use of heated  
20 styling appliances.

Damage to the hair typically manifests itself in cuticle and protein loss from the hair fibre, excessive fibre stiffness, hair fibre brittleness and breakage and frayed or split  
25 ends.

A wide array of ingredients are claimed to be effective in the treatment and prevention of hair damage, as can be seen from the literature and from marketed products.  
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Amine oxides have also been used for the repair and protection of hair use is discussed in co-pending application number PCT/EP01/09275.

- 5 Hair dyes containing hydroxy amine acids are disclosed in US 3 933 422.

The present invention has now found that compositions comprising certain specific hydroxy compounds are effective  
10 for repairing and preventing the principal symptoms of damaged hair.

#### DESCRIPTION OF THE INVENTION

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In a first aspect, the present invention provides hair treatment composition comprising a hydroxy compound having the following parameters:

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- i)  $S_{\text{SOH}} < 9.26$ ;
- ii)  $\text{BIC} > 0.8$ ;
- iii)  $S_{\text{SCH}_3} < 6.26$  and;
- iv) a molecular weight greater than 90

wherein the composition does not dye hair.

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A further aspect of the invention is the use of the above composition for smoothing hair, aligning hair and preventing damage to the hair.

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The invention also relates to a method of treating hair by applying the above composition to the hair.

#### Hair Repair Hydroxy Compound

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Definition of descriptors for the hydroxy compound are taken from Handbook of Molecular Descriptors, Roberto Todeschini and Viviana Consonni 1981. ISBN 3-52-29913-0.

10 These descriptors can be calculated using Cerius 2 4 6 by Accelrys.

The hydroxy compounds of the present invention do not include an acid group as a hydroxy compound. It is also  
15 highly preferred if the hydroxy compound only has the hydroxy group as its sole functional group.

#### Electrotopological State Indices (S<sub>sOH</sub> & S<sub>sCH3</sub>)

$$S_i = I_i + \Delta I_i = I_i + \sum_{j=1}^A \frac{I_i - I_j}{(d_{ij} + 1)^k}$$

Where,

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$I_i$  = the intrinsic state of the  $i^{\text{th}}$  atom

$\Delta I_i$  is the field effect on the  $i^{\text{th}}$  atom calculated as perturbation of the intrinsic state of the  $i^{\text{th}}$  atom by all other atoms in the molecule

25  $d_{ij}$  is the topological distance between the  $i^{\text{th}}$  and  $j^{\text{th}}$  atoms

A is the number of atoms

k is a parameter to modify the influence of distance or nearby atoms for particular studies. (Usually  $k=2$ ).

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The intrinsic state of the  $i^{\text{th}}$  atom is calculated by,

$$I_i = \frac{\left(\frac{2}{L_i}\right)^2 \delta_i^v + 1}{\delta_i}$$

Where,

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$L_i$  is the principal quantum number (2 for C,N,O,F atoms, 3 for Si, S, Cl...)

$\delta_i^v$  is the number valence electrons of the  $i^{\text{th}}$  atom in the H-depleted molecular graph

10  $\delta_i$  is the number of sigma electrons of the  $i^{\text{th}}$  atom in the H-depleted molecular graph

#### References:

15

L. B. Kier and L. H. Hall, An Electrotological-State Index for Atoms in Molecules. *Pharm. Res.*, 7, 801-807.

L. B. Kier and L. H. Hall, Molecular Structure Description.

20 The Electrotological State. *Academic Press, London (UK)*.

#### Multigraph Information Content Indices (BIC)

$$BIC = \frac{IC}{\log_2 \left( \sum_{b=1}^B \pi_b^* \right)}$$

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Where,

B is the number of bonds

$\pi_b^*$  is the conventional bond order of the  $b$  bond

5

The IC is calculated as defined by Shannon's Entropy,

$$IC = - \sum_{g=1}^G \frac{A_g}{A} \cdot \log_2 \frac{A_g}{A} = - \sum_{g=1}^G p_g \cdot \log_2 p_g$$

Where,

10

G runs over G equivalence classes

$A_g$  is the cardinality of the  $g^{\text{th}}$  equivalent class

A is the total number of atoms

$p_g$  is the probability of randomly selecting a vertex of the

15  $g^{\text{th}}$  class

Reference:

- 20 R. Sarker, A. B. Roy, P. K. Sarker, Topological Information  
Content on Genetic Molecules. *I. Math. Biosci.*, 39, 299-312

It is preferred if the molecular weight of the hydroxy  
compound is greater than 100 and/or less than 200. It is  
25 particularly preferred if the molecular weight of the  
hydroxy compound is from 101 to 131.

The hydroxy compounds of this invention are not aromatic.

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Preferred hydroxy compounds have greater than 4 carbon and less than 15 carbon atoms, more preferably 10 carbon atoms or less and most preferably from 5 to 8 carbon atoms.

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It is advantageous if the hydroxy compound has a methyl side chain, preferably one methyl side chain and no other branching.

10 Preferred hydroxy compounds are selected from the group consisting of 2-methyl-2-hexanol, 2-methyl-2-heptanol, 2-methyl-3-heptanol, 2-methyl-2-pentanol, 2-methyl-3-hexanol, 3-methyl-2-pentanol, 2-methyl-1-pentanol and mixtures thereof.

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The total amount of the hair repair compound in hair treatment compositions of the invention is generally from 0.001 to 10 wt%, preferably from 0.01 to 5 wt%, more preferably from 0.05 to 2 wt% and yet more preferably from

20 0.1 to 1 wt%.

#### Product Form

The final product form of hair treatment compositions according to the invention may suitably be, for example, shampoos, conditioners, sprays, mousses, gels, waxes or lotions. Particularly preferred product forms are shampoos, post-wash conditioners (leave-in and rinse-off) and hair treatment products such as hair essences.

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Shampoo compositions preferably comprise one or more cleansing surfactants which are cosmetically acceptable and suitable for topical application to the hair. Further surfactants may be present as emulsifiers.

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Suitable cleansing surfactants, are selected from anionic, amphoteric and zwitterionic surfactants, and mixtures thereof. The cleansing surfactant may be the same surfactant as the emulsifier, or may be different.

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#### **Anionic Cleansing Surfactant**

Shampoo compositions according to the invention will typically comprise one or more anionic cleansing surfactants which are cosmetically acceptable and suitable for topical application to the hair.

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Examples of suitable anionic cleansing surfactants are the alkyl sulphates, alkyl ether sulphates, alkaryl sulphonates, alkanoyl isethionates, alkyl succinates, alkyl sulphosuccinates, N-alkyl sarcosinates, alkyl phosphates, alkyl ether phosphates, alkyl ether carboxylates, and alpha-olefin sulphonates, especially their sodium, magnesium,

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ammonium and mono-, di- and triethanolamine salts. The alkyl and acyl groups generally contain from 8 to 18 carbon atoms and may be unsaturated. The alkyl ether sulphates, alkyl ether phosphates and alkyl ether carboxylates may  
5 contain from 1 to 10 ethylene oxide or propylene oxide units per molecule.

Typical anionic cleansing surfactants for use in shampoo compositions of the invention include sodium oleyl sulpho  
10 succinate, ammonium lauryl sulphosuccinate, ammonium lauryl sulphate, sodium cocoyl isethionate, sodium lauryl isethionate and sodium N-lauryl sarcosinate. The most preferred anionic surfactants are sodium lauryl sulphate, sodium lauryl ether sulphate(n)EO, (where n ranges from 1  
15 to 3), ammonium lauryl sulphate and ammonium lauryl ether sulphate(n)EO, (where n ranges from 1 to 3).

The total amount of anionic cleansing surfactant in shampoo compositions of the invention is generally from 5 to 30,  
20 preferably from 6 to 20, more preferably from 8 to 16 wt%.

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**Co-surfactant**

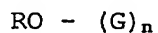
- 5 The shampoo composition can optionally include co-surfactants, preferably an amphoteric or zwitterionic surfactant, which can be included in an amount ranging from 0 to about 8, preferably from 1 to 4 wt%.
- 10 Examples of amphoteric and zwitterionic surfactants include, alkyl betaines, alkyl amidopropyl betaines, alkyl sulphobetaines (sultaines), alkyl glycines, alkyl carboxyglycines, alkyl amphopropionates, alkylamphoglycines, alkyl amidopropyl hydroxysultaines,
- 15 acyl taurates and acyl glutamates, wherein the alkyl and acyl groups have from 8 to 19 carbon atoms. Typical amphoteric and zwitterionic surfactants for use in shampoos of the invention include lauryl amine oxide, cocodimethyl sulphopropyl betaine and preferably lauryl betaine,
- 20 cocamidopropyl betaine and sodium cocamphopropionate.

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Another preferred co-surfactant is a nonionic surfactant, which can be included in an amount ranging from 0 to 8, preferably from 2 to 5 wt%.

5 For example, representative nonionic surfactants that can be included in shampoo compositions of the invention include condensation products of aliphatic ( $C_8 - C_{18}$ ) primary or secondary linear or branched chain alcohols or phenols with alkylene oxides, usually ethylene oxide and generally having  
10 from 6 to 30 ethylene oxide groups.

Further nonionic surfactants which can be included in shampoo compositions of the invention are the alkyl polyglycosides (APGs). Typically, the APG is one which comprises an alkyl  
15 group connected (optionally via a bridging group) to a block of one or more glycosyl groups. Preferred APGs are defined by the following formula:



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wherein R is a branched or straight chain  $C_5$  to  $C_{20}$  alkyl or alkenyl group, G is a saccharide group and n is from 1 to 10.

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Other sugar-derived nonionic surfactants which can be included in shampoo compositions of the invention include the C<sub>10</sub>-C<sub>18</sub> N-alkyl (C<sub>1</sub>-C<sub>6</sub>) polyhydroxy fatty acid amides, such as the C<sub>12</sub>-C<sub>18</sub> N-methyl glucamides, as described for example in WO 92 06154 and US 5 194 639, and the N-alkoxy polyhydroxy fatty acid amides, such as C<sub>10</sub>-C<sub>18</sub> N-(3-methoxypropyl) glucamide.

The shampoo composition can also optionally include one or more cationic co-surfactants included in an amount ranging from 0.01 to 10, more preferably from 0.05 to 5, most preferably from 0.05 to 2 wt%. Useful cationic surfactants are described hereinbelow in relation to conditioner compositions.

The total amount of surfactant (including any co-surfactant, and/or any emulsifier) in shampoo compositions of the invention is generally from 5 to 50, preferably from 5 to 30, more preferably from 10 to 25 wt%.

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### Cationic Polymer

A cationic polymer is a preferred ingredient in shampoo  
5 compositions of the invention, for enhancing conditioning  
performance of the shampoo.

The cationic polymer may be a homopolymer or be formed from  
two or more types of monomers. The molecular weight of the  
polymer will generally be between 5 000 and 10 000 000,  
typically at least 10 000 and preferably in the range 100 000  
to about 2 000 000. The polymers will have cationic nitrogen  
containing groups such as quaternary ammonium or protonated  
amino groups, or a mixture thereof.

Suitable cationic nitrogen polymers are described in the CTFA  
Cosmetic Ingredient Directory, 3rd edition

The cationic conditioning polymers can comprise mixtures of  
monomer units derived from amine- and/or quaternary  
ammonium-substituted monomer and/or compatible spacer  
monomers.

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Suitable cationic conditioning polymers include, copolymers of 1-vinyl-2-pyrrolidine and 1-vinyl-3-methylimidazolium salt (CTFA name Polyquaternium-16); copolymers of 1-vinyl-2-pyrrolidine and dimethylaminoethyl methacrylate, (CTFA name Polyquaternium-11); cationic diallyl quaternary ammonium-containing polymers in particular (CTFA Polyquaternium 6 and Polyquaternium 7, mineral acid salts of amino-alkyl esters of homo- and copolymers of unsaturated carboxylic acids as described in U.S. Patent 4,009,256; cationic polyacrylamides (as described in WO95/22311):

Cationic polysaccharide polymers suitable for use in compositions of the invention include those with an anhydroglucose residual group, such as a starch or cellulose. Cationic cellulose is available from Amerchol Corp. (Edison, NJ, USA) in their Polymer JR (trade mark) and LR (trade mark) series of polymers, as salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10. Another type of cationic cellulose includes the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl

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ammonium-substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. (Edison, NJ, USA) under the tradename Polymer LM-200.

Other suitable cationic polysaccharide polymers include quaternary nitrogen-containing cellulose ethers (e.g. as described in U.S. Patent 3,962,418), and copolymers of etherified cellulose and starch (e.g. as described in U.S. Patent 3,958,581).

A particularly suitable type of cationic polysaccharide polymer that can be used is a cationic guar gum derivative, such as guar hydroxypropyltrimonium chloride (commercially available from Rhone-Poulenc in their JAGUAR trademark series). Particularly preferred cationic polymers are JAGUAR C13S, JAGUAR C14, JAGUAR C15, JAGUAR C17 and JAGUAR C16 Jaguar CHT and JAGUAR C162.

The cationic conditioning polymer will generally be present in compositions of the invention at levels of from 0.01 to 5, preferably from 0.05 to 1, more preferably from 0.08 to 0.5  
5 wt%.

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Conditioning Surfactant

Conditioner compositions usually comprise one or more  
5 conditioning surfactants which are cosmetically acceptable  
and suitable for topical application to the hair.

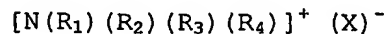
Suitable conditioning surfactants are selected from cationic  
surfactants, used singly or in admixture.

10

Cationic surfactants useful in compositions of the invention  
contain amino or quaternary ammonium hydrophilic moieties  
which are positively charged when dissolved in the aqueous  
composition of the present invention.

15

Examples of suitable cationic surfactants are those  
corresponding to the general formula:



20

in which  $R_1$ ,  $R_2$ ,  $R_3$ , and  $R_4$  are independently selected from (a)  
an aliphatic group of from 1 to 22 carbon atoms, or (b) an  
aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl,

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aryl or alkylaryl group having up to 22 carbon atoms; and X  
is a salt-forming anion such as those selected from halogen,  
(e.g. chloride, bromide), acetate, citrate, lactate,  
glycolate, phosphate nitrate, sulphate, and alkylsulphate  
5 radicals.

The aliphatic groups can contain, in addition to carbon and  
hydrogen atoms, ether linkages, and other groups such as  
amino groups. The longer chain aliphatic groups, e.g., those  
10 of about 12 carbons, or higher, can be saturated or  
unsaturated.

The most preferred cationic surfactants for conditioner  
compositions of the present invention are monoalkyl  
15 quaternary ammonium compounds in which the alkyl chain  
length is C16 to C22.

Examples of suitable cationic surfactants include quaternary  
ammonium compounds, particularly trimethyl quaternary  
20 compounds.

Preferred quaternary ammonium compounds include  
cetyltrimethylammonium chloride, behenyltrimethylammonium

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chloride (BTAC), cetylpyridinium chloride,  
tetramethylammonium chloride, tetraethylammonium chloride,  
octyltrimethylammonium chloride, dodecyltrimethylammonium  
chloride, hexadecyltrimethylammonium chloride,  
5 octyldimethylbenzylammonium chloride,  
decyldimethylbenzylammonium chloride,  
stearyldimethylbenzylammonium chloride,  
didodecyldimethylammonium chloride,  
dioctadecyldimethylammonium chloride, tallowtrimethylammonium  
10 chloride, cocotrimethylammonium chloride, PEG-2 oleylammonium  
chloride and salts of these where the chloride is replaced  
by halogen, (e.g. , bromide), acetate, citrate, lactate,  
glycolate, phosphate nitrate, sulphate, or alkylsulphate.  
Further suitable cationic surfactants include those materials  
15 having the CTFA designations Quaternium-5, Quaternium-31 and  
Quaternium-18. Mixtures of any of the foregoing materials  
may also be suitable. A particularly useful cationic  
surfactant for use in hair conditioners of the invention is  
cetyltrimethylammonium chloride, available commercially, for  
20 example as GENAMIN CTAC, ex Hoechst Celanese.

Salts of primary, secondary, and tertiary fatty amines are  
also suitable cationic surfactants. The alkyl groups of such

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amines preferably have from 12 to 22 carbon atoms, and can be substituted or unsubstituted.

Particularly useful are amido substituted tertiary fatty  
amines, in particular tertiary amines having one C<sub>12</sub> to C<sub>22</sub>  
alkyl or lakenyl chain. Such amines, useful herein, include  
stearamidopropyldimethylamine,  
stearamidopropyldiethylamine, stearamidoethyldiethylamine,  
stearamidoethyldimethylamine, palmitamidopropyld  
imethylamine, palmitamidopropyldiethylamine,  
palmitamidoethyldiethylamine, palmitamidoethyldimethylamine,  
behenamidopropyldimethylamine,  
behenamidopropyldiethylamine, behenamidoethyldiethylamine,  
behenamidoethyldimethylamine,  
arachidamidopropyldimethylamine, arachid  
amidopropyldiethylamine, arachidamidoethyldiethylamine,  
arachidamidoethyldimethylamine, diethylaminoethylstearamide.  
Also useful are dimethylstearamine, dimethylsoyamine,  
soyamine, myristylamine, tridecylamine, ethylstearylamine, N-  
tallowpropane diamine, ethoxylated (with 5 moles of ethylene  
oxide) stearylamine, dihydroxyethylstearylamine, and  
arachidyl behenylamine.

- 19 -

These amines are typically used in combination with an acid to provide the cationic species. The preferred acid useful herein includes L- glutamic acid, lactic acid, hydrochloric acid, malic acid, succinic acid, acetic acid, fumaric acid, tartaric acid, citric acid, L-glutamic hydrochloride, and mixtures thereof; more preferably L-glutamic acid, lactic acid, citric acid. Cationic amine surfactants included among those useful in the present invention are disclosed in U.S. Patent 4,275,055 to Nachtigal, et al., issued June 23, 1981.

10

The molar ratio of protonatable amines to  $H^+$  from the acid is preferably from about 1:0.3 to 1:1.2, and more preferably from about 1:0.5 to about 1:1.1.

15

In the conditioners of the invention, the level of cationic surfactant is preferably from 0.01 to 10, more preferably 0.05 to 5, most preferably 0.1 to 2 wt% of the total composition.

20

The cationic surfactants detailed in this section are also suitable for use in the aspect of the invention wherein a cationic surfactant is intimately mixed with the

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thermotropic mesogenic material and with oily conditioning material prior to the incorporation of the conditioning material into the final hair conditioning composition

## 5 Fatty Materials

Conditioner compositions of the invention preferably additionally comprise fatty materials. The combined use of fatty materials and cationic surfactants in conditioning compositions is believed to be especially advantageous, because this leads to the formation of a structured phase, in which the cationic surfactant is dispersed.

By "fatty material" is meant a fatty alcohol, an alkoxylated fatty alcohol, a fatty acid or a mixture thereof.

Preferably, the alkyl chain of the fatty material is fully saturated.

Representative fatty materials comprise from 8 to 22 carbon atoms, more preferably 16 to 22. Examples of suitable fatty alcohols include cetyl alcohol, stearyl alcohol and mixtures thereof. The use of these materials is also advantageous in

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that they contribute to the overall conditioning properties of compositions of the invention.

Alkoxylated, (e.g. ethoxylated or propoxylated) fatty  
5 alcohols having from about 12 to about 18 carbon atoms in the alkyl chain can be used in place of, or in addition to, the fatty alcohols themselves. Suitable examples include ethylene glycol cetyl ether, polyoxyethylene (2) stearyl ether, polyoxyethylene (4) cetyl ether, and mixtures  
10 thereof.

The level of fatty alcohol material in conditioners of the invention is suitably from 0.01 to 15, preferably from 0.1 to 10, and more preferably from 0.1 to 5 wt%. The weight ratio  
15 of cationic surfactant to fatty alcohol is suitably from 10:1 to 1:10, preferably from 4:1 to 1:8, optimally from 1:1 to 1:7, for example 1:3.

#### OPTIONAL INGREDIENTS

20

##### Suspending Agents

In a preferred embodiment, the hair treatment composition, especially if it is a shampoo composition, further comprises

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from 0.1 to 5 wt% of a suspending agent. Suitable suspending agents are selected from polyacrylic acids, cross-linked polymers of acrylic acid, copolymers of acrylic acid with a hydrophobic monomer, copolymers of carboxylic acid-containing monomers and acrylic esters, cross-linked copolymers of acrylic acid and acrylate esters, heteropolysaccharide gums and crystalline long chain acyl derivatives. The long chain acyl derivative is desirably selected from ethylene glycol stearate, alkanolamides of fatty acids having from 16 to 22 carbon atoms and mixtures thereof. Ethylene glycol distearate and polyethylene glycol 3 distearate are preferred long chain acyl derivatives. Polyacrylic acid is available commercially as Carbopol 420, Carbopol 488 or Carbopol 493. Polymers of acrylic acid cross-linked with a polyfunctional agent may also be used, they are available commercially as Carbopol 910, Carbopol 934, Carbopol 941 and Carbopol 980. An example of a suitable copolymer of a carboxylic acid containing a monomer and acrylic acid esters is Carbopol 1342. All Carbopol (trade mark) materials are available from Goodrich.

Suitable cross-linked polymers of acrylic acid and acrylate esters are Pemulen TR1 or Pemulen TR2. A suitable heteropolysaccharide gum is xanthan gum, for example that available as Kelzan mu.

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### Conditioning Agents

#### Silicone Conditioning Agents

The compositions of the invention can contain, emulsified droplets of a silicone conditioning agent, for enhancing  
5 conditioning performance.

Suitable silicones include polydiorganosiloxanes, in particular polydimethylsiloxanes which have the CTFA designation dimethicone. Also suitable for use compositions  
10 of the invention (particularly shampoos and conditioners) are polydimethyl siloxanes having hydroxyl end groups, which have the CTFA designation dimethiconol. Also suitable for use in compositions of the invention are silicone gums having a slight degree of cross-linking, as are described  
15 for example in WO 96/31188.

The viscosity of the emulsified silicone itself (not the emulsion or the final hair conditioning composition) is typically at least 10,000 cst at 25 °C the viscosity of the  
20 silicone itself is preferably at least 60,000 cst, most preferably at least 500,000 cst, ideally at least 1,000,000 cst. Preferably the viscosity does not exceed  $10^9$  cst for ease of formulation.

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Emulsified silicones for use in the shampoo compositions of the invention will typically have an average silicone droplet size in the composition of less than 30, preferably less than 20, more preferably less than 10  $\mu\text{m}$ , ideally from 5 0.01 to 1  $\mu\text{m}$ . Silicone emulsions having an average silicone droplet size of  $\leq 0.15 \mu\text{m}$  are generally termed microemulsions.

Examples of suitable pre-formed emulsions include emulsions 10 DC2-1766, DC2-1784, DC-1785 DC-1786 and microemulsions DC2-1865 and DC2-1870, all available from Dow Corning. These are all emulsions/microemulsions of dimethiconol. Cross-linked silicone gums are also available in a pre-emulsified form, which is advantageous for ease of formulation. A 15 preferred example is the material available from Dow Corning as DC X2-1787, which is an emulsion of cross-linked dimethiconol gum. A further preferred example is the material available from Dow Corning as DC X2-1391, which is a microemulsion of cross-linked dimethiconol gum.

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A further preferred class of silicones for inclusion in shampoos and conditioners of the invention are amino functional silicones. By "amino functional silicone" is

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meant a silicone containing at least one primary, secondary or tertiary amine group, or a quaternary ammonium group.

Examples of suitable amino functional silicones include:

polysiloxanes having the CTFA designation "amodimethicone",

5 Specific examples of amino functional silicones suitable for use in the invention are the aminosilicone oils DC2-8220, DC2-8166, DC2-8466, and DC2-8950-114 (all ex Dow Corning), and GE 1149-75, (ex General Electric Silicones).

Suitable quaternary silicone polymers are described in EP-A-  
10 0 530 974. A preferred quaternary silicone polymer is K3474, ex Goldschmidt.

Also suitable are emulsions of amino functional silicone oils with non ionic and/or cationic surfactant.

15 Pre-formed emulsions of amino functional silicone are also available from suppliers of silicone oils such as Dow Corning and General Electric. Specific examples include DC929 Cationic Emulsion, DC939 Cationic Emulsion, and the non-ionic emulsions DC2-7224, DC2-8467, DC2-8177 and DC2-  
20 8154 (all ex Dow Corning).

With some shampoos it is particularly preferred to use a combination of amino and non amino functional silicones

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The total amount of silicone is preferably from 0.01 to 10 %wt of the total composition more preferably from 0.3 to 5, most preferably 0.5 to 3 wt% is a suitable level.

5   (ii)    **Non-silicone Oily Conditioning Components**

Compositions according to the present invention may also comprise a dispersed, non-volatile, water-insoluble oily conditioning agent.

10

By "insoluble" is meant that the material is not soluble in water (distilled or equivalent) at a concentration of 0.1% (w/w), at 25°C.

15   Suitable oily or fatty materials are selected from hydrocarbon oils, fatty esters and mixtures thereof. Straight chain hydrocarbon oils will preferably contain from about 12 to about 30 carbon atoms. Also suitable are polymeric hydrocarbons of alkenyl monomers, such as C<sub>2</sub>-C<sub>6</sub>  
20   alkenyl monomers.

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Specific examples of suitable hydrocarbon oils include paraffin oil, mineral oil, saturated and unsaturated dodecane, saturated and unsaturated tridecane, saturated and unsaturated tetradecane, saturated and unsaturated pentadecane, saturated and unsaturated hexadecane, and mixtures thereof. Branched-chain isomers of these compounds, as well as of higher chain length hydrocarbons, can also be used.

10 Suitable fatty esters are characterised by having at least 10 carbon atoms, and include esters with hydrocarbyl chains derived from fatty acids or alcohols, Monocarboxylic acid esters include esters of alcohols and/or acids of the formula  $R'COOR$  in which  $R'$  and  $R$  independently denote alkyl or alkenyl radicals and the sum of carbon atoms in  $R'$  and  $R$  is at least 10, preferably at least 20. Di- and trialkyl and alkenyl esters of carboxylic acids can also be used.

15

Particularly preferred fatty esters are mono-, di- and triglycerides, more specifically the mono-, di-, and tri-esters of glycerol and long chain carboxylic acids such as  $C_1$ - $C_{22}$  carboxylic acids. Preferred materials include cocoa

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butter, palm stearin, sunflower oil, soyabean oil and coconut oil.

The oily or fatty material is suitably present at a level of  
5 from 0.05 to 10, preferably from 0.2 to 5, more preferably from about 0.5 to 3 wt%.

In hair treatment compositions containing a conditioning agent, it is preferred that a cationic polymer also be  
10 present.

#### Adjuvants

The compositions of the present invention may also contain  
15 adjuvants suitable for hair care. Generally such ingredients are included individually at a level of up to 2, preferably up to 1 wt% of the total composition.

It is preferable if the composition comprise less than 70  
20 wt.% of ethanol in the total composition.

Suitable hair care adjuvants, include amino acids, sugars and ceramides.

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The invention will now be further illustrated by the following, non-limiting Examples.

Examples of the invention are illustrated by a number,

5 Comparative Examples are illustrated by a letter.

All percentages quoted are by weight based on total weight unless otherwise stated.

#### EXAMPLES

10

##### Examples A-C and 1-7

A base shampoo composition was prepared, comprising 12 wt% sodium lauryl ether sulphate (2EO), 20 wt.% cocoamidopropyl  
15 betaine and 86 wt. % water.

To this base solution 0.03M of the following compounds was added:

20 Compound A is 2,4-dimethyl-4-heptanol (does not meet the claimed criteria)

Compound B is 3,7-dimethyl-3-octanol (does not meet the claimed criteria)

Compound C is 4-methyl-2-pentanol (does not meet the claimed  
25 criteria)

Compound 1 is 2-methyl-2-hexanol,

Compound 2 is 2-methyl-2-heptanol,

Compound 3 is 2-methyl-3-heptanol,

Compound 4 is 2-methyl-2-pentanol,

30 Compound 5 is 2-methyl-3-hexanol,

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Compound 6 is 3-methyl-2-pentanol,  
Compound 7 is 2-methyl-1-pentanol

The compositions were tested in a cuticle abrasion test.

- 5 Root end hair (as received from the supplier) was pre-cleaned by washing for 1 minute in Composition I followed by copious rinsing in double deionised water. The hair was left to dry naturally over 24 hrs.
- 10 For each test, 4 g of hair was washed in 0.4 g of the test composition for 30 seconds, rinsed for 30 seconds, and the washing/rinsing cycle repeated. The hair was left to dry naturally overnight.
- 15 The hair was cut into 1 cm lengths, placed in a blender bucket and 200 ml of double de-ionised water was added. The blender was placed on full power for 1 minute. The liquor was decanted off and transferred to a 50 ml centrifuge tube and centrifuged for 10 minutes at 4,300 RPM. The resulting  
20 clear liquor was decanted off leaving the cuticle sediment at the bottom of the tube.

- The cuticle was transferred from the tube into a beaker with 3 x 5 ml washes and passed through a series of sieves (425  
25 and 53 microns). The sieves were washed with a further 2 x 10 ml of water to ensure complete recovery of the cuticle. The sample was made up to 50 ml in a centrifuge tube, centrifuged for 15 minutes and the liquor decanted off. The cuticle was transferred with double deionised water (2 x  
30 10 ml washes) to a beaker and freeze-dried.

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The freeze-dried cuticle was weighed back to determine percentage recovery.

The results were as follows:

5

	Example								
	A	B	C	1	2	3	4	6	7
% recovery	0.84	0.84	0.79	0.53	0.54	0.55	0.58	0.62	0.64

Numbered compositions according to the invention perform better than comparative Examples A, B, C.

10 Example 8

The following shampoo composition was prepared:

Ingredient	
Chemical Name	Active weight %
SLES 2EO	14
Cocoamidopropylbetaine	2
Guar hydroxypropyltrimonium chloride	0.1
Dimethiconol	1
Mica + titanium dioxide	0.2
Sodium benzoate	0.5
Water	to 100
Crosslinked polyacrylic acid	0.4
Compound 1,2,3, or 6	1

15 Compound 1,2,3 or 6 as described above.

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Example 9

The following is an example of a hair conditioning composition according to the invention:

5

Ingredient	Trade name	Supplier	% w/w
Deionised water			q.s. to 100
Compound 1, 2, 3 or 4			0.5
Behenyl trimethyl ammonium chloride	Genamin KDM-P	Clairant	1
Behenyl alcohol			5
Silicone emulsion	DC2-1784	Dow Corning	2
Disodium EDTA			0.1
Methyl paraben	Nipagin	Nipa Lab	0.2
Perfume			0.5

Compound 1,2,3 or 4 as described above.